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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/966,651	09/28/2001	Mei Zhu	01-446	5258

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EXAMINER

WONG, EDNA

ART UNIT	PAPER NUMBER
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1753

DATE MAILED: 08/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/966,651

Applicant(s)

ZHU ET AL.

Examiner

Edna Wong

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-- **Th MAILING DATE of this communication appears on the cover sheet with the correspond nce address --**
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2. 6) ☐ Other:

Claim Objections

Claim **13** is objected to because of the following informalities:

Claim 13

line 14, a -- , -- (comma) should be inserted after the word "feature".

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Product

I. Claims **12 and 17** are rejected under 35 U.S.C. 102(e) as being anticipated by **Woo et al.** (US Patent No. 6,440,289 B1).

Woo teaches an integrated circuit (Fig. 1B).

As to the improvement comprising the electrically conductive structure formed according to the method of claim 1 or claim 13, the invention defined in a product by

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process claim is a product, not a process. *In re Bridgeford* 679, 149 USPQ 55 (CCPA 1966). It is the patentability of the product claimed and NOT of the recited process steps which must be established. *In re Brown* 459 F. 2d 531, 173 USPQ 685 (CCPA 1972); *In re Wertheim* 541 F. 2d 257, 191 USPQ 90 (CCPA 1976).

When the prior art discloses a product which reasonably appears to be either identical with or only slightly different than a product claim in a product-by-process claim, the burden is on the Applicants to present evidence from which the Examiner could reasonably conclude that the claimed product differs in kind from those of the prior art. *In re Brown* 459 F. 2d 531, 173 USPQ 685 (CCPA 1972); *In re Fessman* 489 F. 2d 742, 180 USPQ 685 (CCPA 1972) and MPEP § 2113.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Method

I. Claims 1-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Woo et al.** (US Patent No. 6,440,289 B1) in combination with **Taylor et al.** (US Patent No. 6,303,014 B1).

Woo teaches a method for forming an electrically conductive structure on a

substrate, the method comprising the steps of:

- (a) forming an electrically conductive electrode layer on the substrate **126A**; and
- (b) forming an electrically conductive conduction layer **126B** over the electrode layer by:
 - (i) placing the substrate in a plating solution (= ECD plating bath) [col. 6, lines 57-60];
 - (ii) applying a first current **146** to the substrate at a first bias and a first density for a first duration;
 - (iii) applying a second current **148** to the substrate at a second bias and a second current density for a second duration (col. 5, lines 20-35; col. 8, lines 4-15; and Fig. 5); and
 - (iv) cyclically applying the first current and the second current (= there are many forward and reverse pulses **146** and **148**) [col. 5, lines 27-29] at a frequency.

The first bias is a forward bias (col. 5, lines 20-35; col. 8, lines 4-15; and Fig. 5).

The second bias is a reverse bias (col. 5, lines 20-35; col. 8, lines 4-15; and Fig. 5).

The method further comprises the step of forming an etched feature **106** in the substrate prior to the step of forming the electrode layer (col. 1, line 66 to col. 2, line 22).

The method further comprises immediately applying the second current after the application of the first current without a dead time between the application of the first current and the application of the second current (Fig. 5).

The method further comprises a dead time between the application of the second current and the succeeding application of the first current, where no current is applied to the substrate (Fig. 5).

A direct current bulk deposition is applied at a forward bias (= the higher current density *could also be applied* as bi-directional current pulses **147**) [Fig. 5] (col. 4, line 65 to col. 5, line 2; col. 5, lines 31-35; and Figs. 3 and 5).

Woo does not teach wherein the frequency is between about 30 hertz and about 130 hertz.

However, Taylor teaches a method for forming an electrically conductive structure on a substrate wherein the frequency is between about 30 hertz and about 130 hertz (= from about 10 Hertz to about 1200 Hertz). The frequencies generally used for larger recesses may range from about 100 Hz to about 3000 Hz and frequencies generally used for smaller recesses may range from about 2500 Hz to about 12000 Hz (col. 13, lines 40-64).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one skilled in the art would have been motivated to have modified the method of Woo with wherein the frequency is between about 30 hertz and about 130 hertz because the frequency is a result-effective

variable and one skilled in the art has the skill to calculate the frequency that would determine the success of the desired reaction to occur, i.e., filling large or small recesses, absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(b).

As to wherein the density of the second current is between about 2 times and about 4 times the density of the first current, the second current density is a result-effective variable and one skilled in the art has the skill to calculate the second current density range that would determine the success of the desired reaction to occur, absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(b).

As to wherein the first duration is between about 4 and about 20 milliseconds, the first duration is a result-effective variable and one skilled in the art has the skill to calculate the duration that would determine the success of the desired reaction to occur, absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(b).

Taylor teaches that the cathodic and anodic pulse widths may vary from about 1 microsecond to about 100 millisecond (col. 13, lines 53-54). Taylor teaches that the cathodic on-time t_c was 9.2 ms (cols. 18-19, Example 1).

As to wherein the second duration is between about 1 and about 4 milliseconds, the second duration is a result-effective variable and one skilled in the art has the skill to calculate the duration that would determine the success of the desired reaction to occur,

absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(b).

Taylor teaches that the cathodic and anodic pulse widths may vary from about 1 microsecond to about 100 millisecond (col. 13, lines 53-54). Taylor teaches that the anodic on-time was 1 ms (cols. 18-19, Example 1).

As to wherein the first duration corresponds to a depletion time of the plating solution, Woo discloses applying a first current **146** to the substrate at a first bias and a first density for a first duration in a similar manner as instantly claimed. Therefore, it would have been within the skill of the art to expect that similar processes produce similar results.

Furthermore, the Applicants may have a different reason for, or advantage resulting from doing what the prior art relied upon has suggested, it is noted that it is well settled that this is not demonstrative of nonobviousness. *In re Kronig* 190 USPQ 425, 428 (CCPA 1976); *In re Linter* 173 USPQ 560 (CCPA 1972). The prior art motivation or advantage may be different than that of Applicants while still supporting a conclusion of obviousness. *In re Wiseman* 201 USPQ 658 (CCPA 1979); *Ex parte Obiaya* 227 USPQ 58 (Bd. of App. 1985) and MPEP § 2144.

As to wherein the second duration corresponds to a replenishment time of the plating solution and an etch time of corners of trenches in the substrate, Woo discloses applying a second current **148** to the substrate at a second bias and a second current

density for a second duration in a similar manner as instantly claimed. Therefore, it would have been within the skill of the art to expect that similar processes produce similar results.

Furthermore, the Applicants may have a different reason for, or advantage resulting from doing what the prior art relied upon has suggested, it is noted that it is well settled that this is not demonstrative of nonobviousness. *In re Kronig* 190 USPQ 425, 428 (CCPA 1976); *In re Linter* 173 USPQ 560 (CCPA 1972). The prior art motivation or advantage may be different than that of Applicants while still supporting a conclusion of obviousness. *In re Wiseman* 201 USPQ 658 (CCPA 1979); *Ex parte Obiaya* 227 USPQ 58 (Bd. of App. 1985) and MPEP § 2144.

II. Claims **13-16** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Woo et al.** (US Patent No. 6,440,289 b1) in combination with **Taylor et al.** (US Patent No. 6,303,014 B1).

Woo and Taylor are as applied for the reasons discussed above and incorporated herein.

III. Claims **18-20** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Woo et al.** (US Patent No. 6,440,289 B1) in combination with **Taylor et al.** (US Patent No. 6,303,014 B1) and **Dubin et al.** (US Patent No. 6,432,821 B1).

Woo and Taylor are as applied for the reasons discussed above and

incorporated herein.

Woo does not teach applying a direct current patch deposition at a forward bias.

However, Dubin teaches that conventional (prior art) plating programs perform an initiation, or seed layer repair, operation by forcing a first forward current (col. 3, line 66 to col. 4, line 47; and Figs. 2-6).

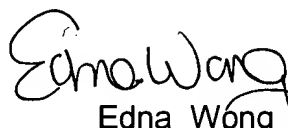
Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one skilled in the art would have been motivated to have modified the method of Woo by applying a direct current patch deposition at a forward bias because this would have repaired the seed layer as taught by Dubin (col. 3, line 66 to col. 4, line 47, esp., col. 4, lines 4-6; and Figs. 2-6).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (703) 308-3818. The examiner can normally be reached on Mon-Fri 7:30 am to 5:00 pm, alt. Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (703) 308-3322. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1495.


Edna Wong
Primary Examiner
Art Unit 1753

EW
August 26, 2003